



2010/2011 Dworshak Projects



# Challenges Bringing Us Together

Capital/Operational Costs  
& an Extensive Deferred  
Maintenance List



River Water  
Quality

- Pathology (IHNV)
- Effluent Treatment



Reservoir Water Mgmt &  
Maximizing Opportunities  
for Operational Synergy  
Between Hatcheries





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 10

1200 Sixth Avenue, Suite 900  
Seattle, Washington 98101-3140

FEB -9 2011

OFFICE OF  
COMPLIANCE AND ENFORCEMENT

Reply To: OCE-133

CERTIFIED MAIL - 7009 141 0 0002 1489 0961

RETURN RECEIPT REQUESTED

**NOTICE OF NONCOMPLIANCE**

Mr. Larry Peltz  
Manager, Dworshak Fisheries Complex  
U.S. Fish and Wildlife Service  
Dworshak National Fish Hatchery  
4147 Ahsahka Road  
Ahsahka, Idaho 83520

Re: Notice of Continuing Noncompliance for Cold Water Aquaculture  
NPDES Permit Number IDG131003

Dear Mr. Peltz:

This Notice of Noncompliance (NON) is issued under the Clean Water Act (CWA), 33 U.S.C. § 1251 *et seq.* This NON is issued consistent with Executive Order (E.O.) 12088, 43 Fed. Reg. 47707 (October 13, 1978). Section 313(a) of the CWA, 33 U.S.C. §1323(a), and E.O. 12088 provide that each Executive agency must comply with the same substantive, procedural, and other requirements that would apply to a private person under the CWA.

On December 11, 2008, the U.S. Environmental Protection Agency (EPA) issued a Notice of Violation (NOV) to the U.S. Fish and Wildlife Service (USFWS) concerning ongoing violations at the Dworshak National Fish Hatchery (Facility). Since that time, EPA has been in discussions with USFWS and its partners concerning the need to quickly achieve full compliance with the *Cold Water Aquaculture Facilities in Idaho* General National Pollutant Discharge Elimination System (NPDES) Permit (Permit).

At this time, USFWS has resolved all but two permit violations set forth in the December 11, 2008 NOV. The two ongoing permit violations are as follows:

- The Facility discharges untreated cleaning wastes from Burrows System III on approximately a weekly basis in violation of Section II.B.2.d of the Permit; and
- Part of the Facility's flow is measured on approximately a monthly basis with methods not currently meeting approval criteria described in Section II.A of the Permit.<sup>1</sup>

Between December 2007 and the present, the Facility has accumulated over two-hundred ninety (290) violations. EPA strongly encourages USFWS to resolve the continuing Permit violations at the Facility as soon as possible. EPA believes that the Facility should strive to achieve compliance with the Permit in the near term. Every month that the Facility is out of compliance with the Permit, it continues to accrue permit violations.

Please contact Chris Gebhardt of my staff at (206) 553-0253 or Courtney Weber, Assistant Regional Counsel, at (206) 553-1477, if you have any questions about this letter or your responsibilities under the CWA.

Sincerely,

  
Edward J. Kowalski  
Director

# Dworshak Hatchery Catalysts for Change



# In-House River-to-Reservoir Water Project



+



=



# Utilize Reservoir Water in System I to Delay Exposure of Steelhead to River Water

		Clearwater Hatchery			Dworshak Available					Dworshak Available	
		Available Flow in CFS			Flow in CFS			City Water		Flow in GPM	
		Primary	Secondary		Primary	Secondary		Available		Primary	Secondary
January		65	9		5.7	0		6		5265	0
February		65	9		5.7	0		6		5265	0
March		65	9		5.7	0		6		5265	0
April		65	9		5.7	0		6		5265	0
May		20.7	9		50	0		6		25200	0
June 1-14		20.7	9		50	0		6		25200	0
June 15-30		45.7	9		25	0		6		13950	0
July 1-14		45.7	9		25	0		6		13950	0
July 15-31		54	9		16.7	0		6		10215	0
August		65	9		16.7	0		6		10215	0
September		65	9		5.7	0		6		5265	0
October		65	9		5.7	0		6		5265	0
November		65	9		5.7	0		6		5265	0
December		65	9		5.7	0		6		5265	0

24" Reservoir  
Line in  
Mechanical  
System 1 Bldg.  
Originally used  
only for  
Incubation and  
Domestic Water  
Supply.





20" Steel Pipe  
Welded to 24"  
Reservoir  
Pipeline for  
delivery of  
reservoir water  
to System 1.

Valve that was installed on welded pipe addition to allow 'hot tap' procedure to connect System 1 to 24" reservoir line without shutting down Nursery or Incubation water supplies.





Once the isolation valve was installed, the 'hot-tap' hydraulic drill could be lowered into the utilidoor to make the reservoir water line tap without shutting down.

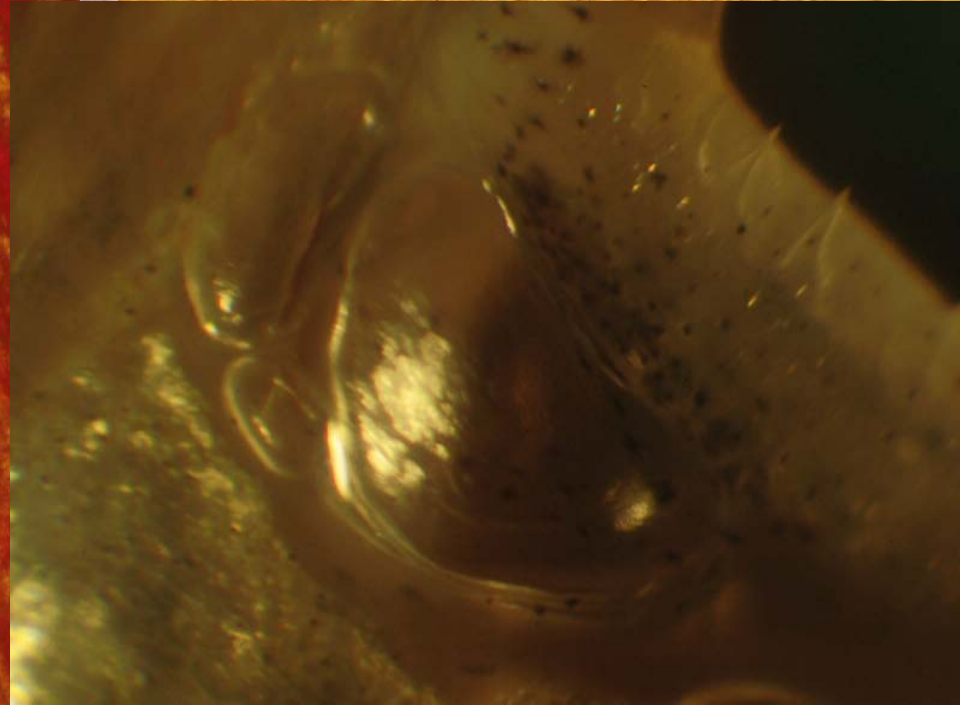
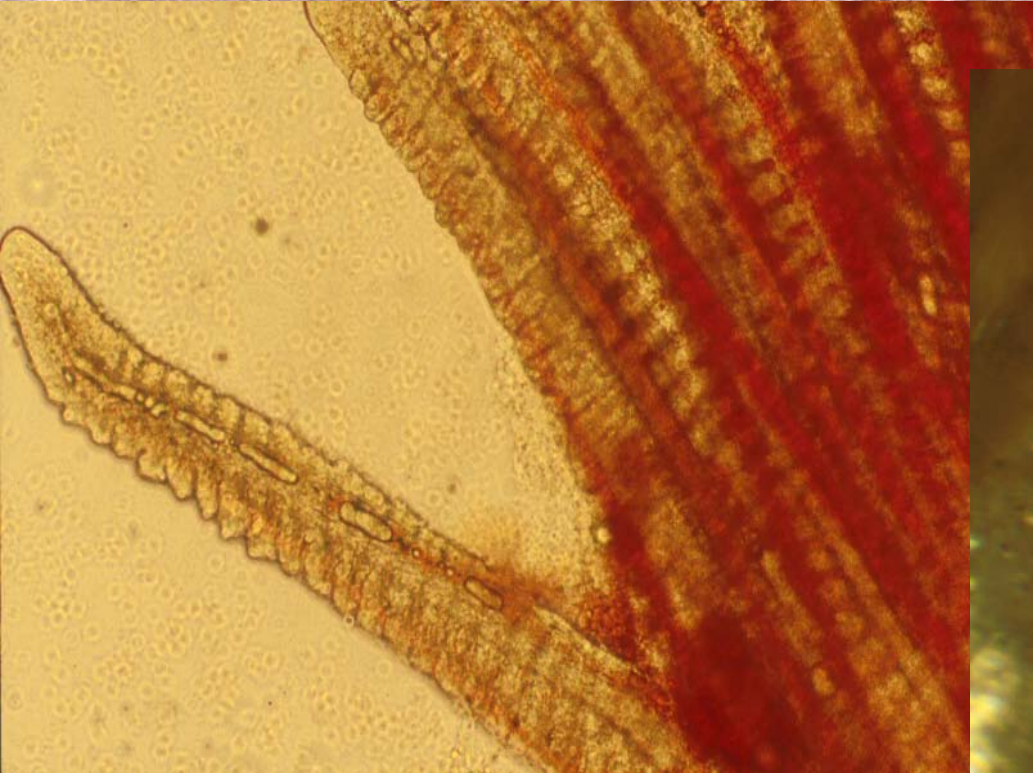
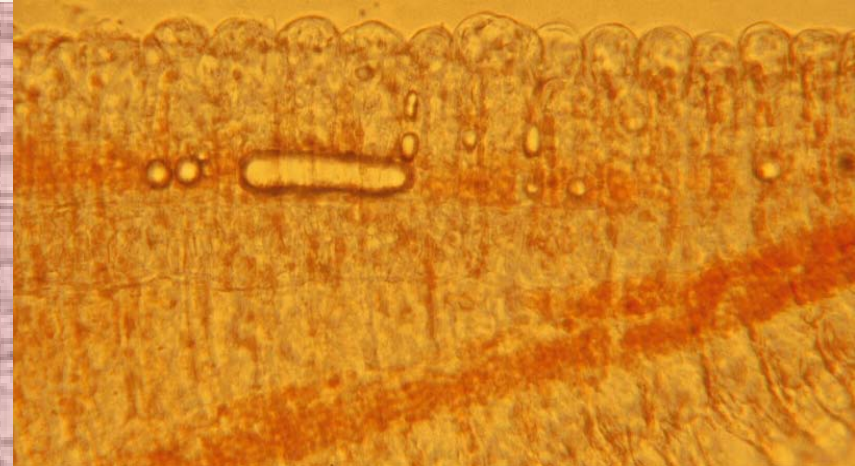
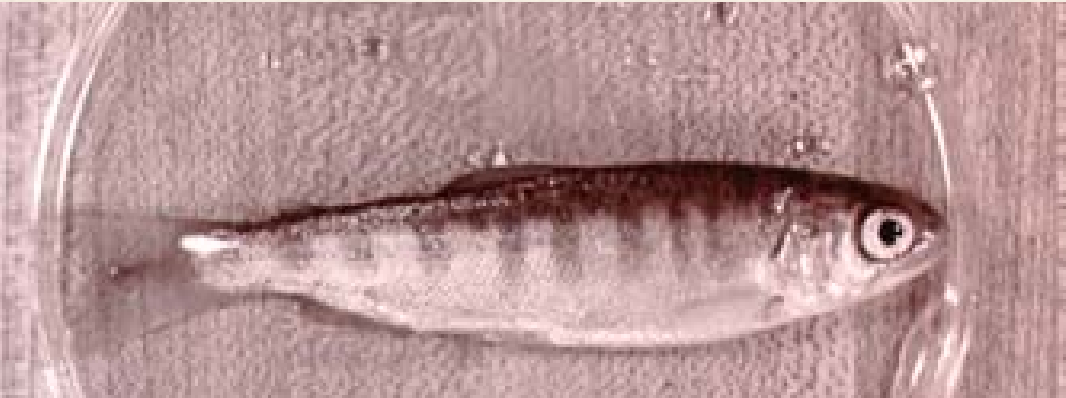


20" pipeline connected to 30" reuse line to deliver reservoir water to reuse system sump. Effluent clarifier return lines (16" pipes) needed to be isolated with external standpipes. Long handwheel allows remote water flow adjustment.

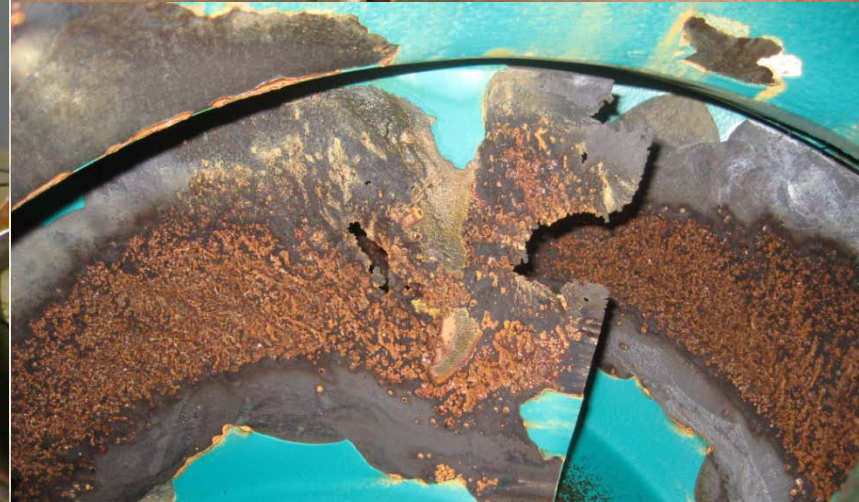
Doppler-style external flow meter and remote handwheel allow operator to control flows within allowable limits set by Clearwater Hatchery




# In-House Reservoir Water Degassing Project



Reservoir Water TDG Levels Exceed River Water TDG Levels & River Water TDG's Are High Enough To.....



A photograph of an industrial facility, likely a water treatment plant, featuring large concrete degassing towers and a network of white pipes. In the foreground, there is a walkway with a metal railing and several flow control valves with yellow handwheels. A flow meter is also visible on the railing. The background shows a forested hillside.

New Degassing Towers  
to Reduce Nitrogen  
Saturation Levels From  
107.5% to 98.6%

Flow Control Valve

Flow Meter

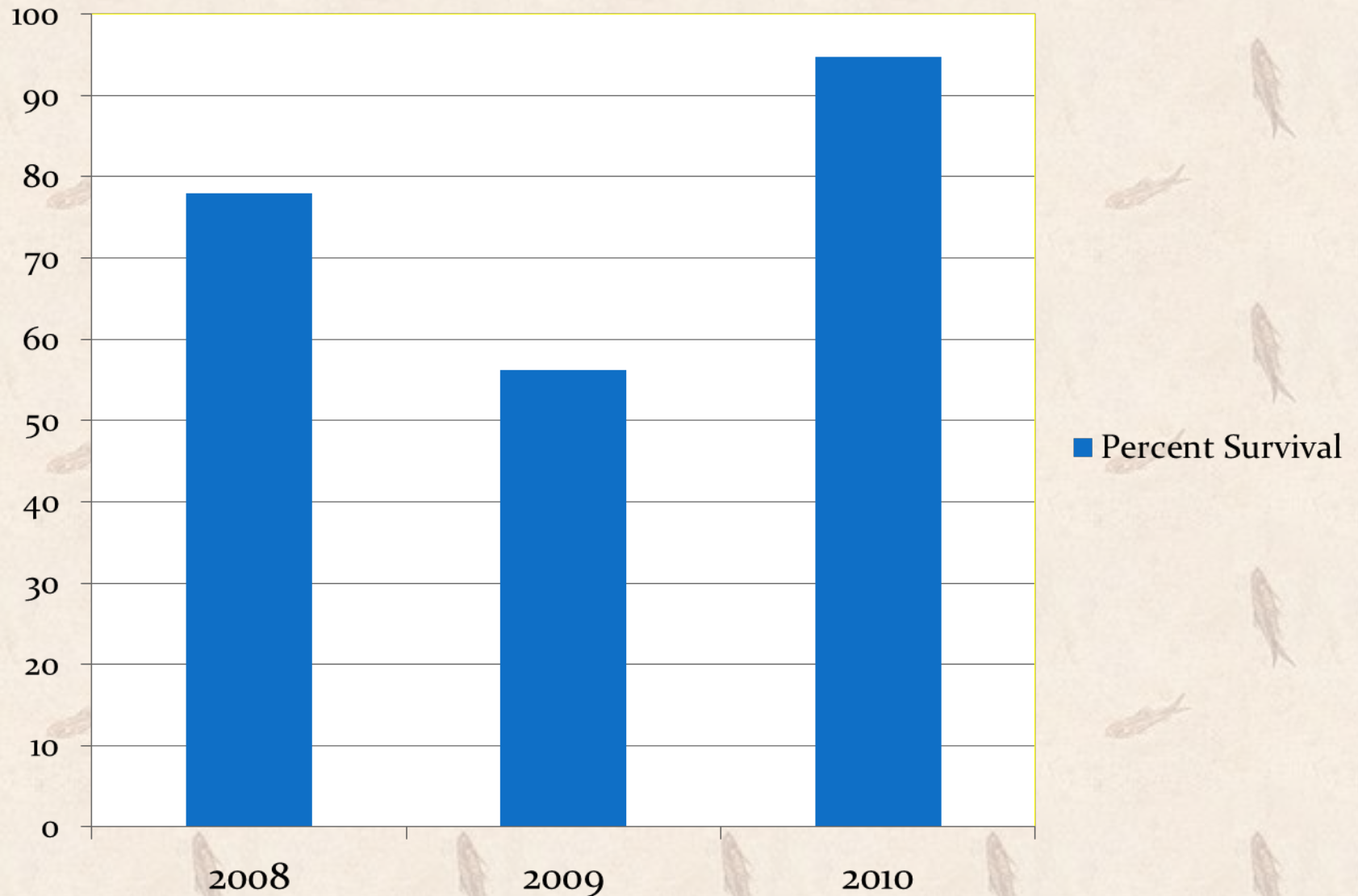
Degassing  
Towers Showing  
~45" Water  
Column Vacuum  
In Operation.  
Influent  
TDG=107.5%  
Effluent  
TDG=98.6%



# Results

- Modification were successfully made to provide degassed water at warmer than historical temps without the use of the existing reuse systems
- Four ponds were utilized as a 'Control Group' of fish and reared on river water for comparison. Two of those four ponds had to be destroyed in early Sept due to high level mortality from IHNV
  - This 50% loss rate due to IHNV is similar to 2009/2010 production losses, however ALL steelhead were on river water then
- No IHNV in fish reared on reservoir water until after September 1 when river water was blended with reservoir water to keep reservoir water use at Dworshak below 5200 gpm.
  - Fish impacted were smaller than 60 fpp (only in takes 9 and 10)

# Percent Survival: Outside Ponding through September



# Cost of Modifications

- Reservoir Line Modifications ~\$75,000
- Degassing towers and components ~\$50,000
- Total \$125,000

(about one less zero than typical)

## Mark's Practical Terms (Return on Investment)

- Additional 1,000,000 fish on hand over last year despite similar river-water IHNV mortality rates
- Cost of production per fish ~\$1.70
- \$1,700,000 inventory saved @ \$0.07 on the dollar!

# As a result of these in-house efforts....

- LSRCP was completing a study to try to deliver an additional ~10,000 GPM from the reservoir to Clearwater Hatchery
- Initial cost estimates exceeded \$5,000,000
- LSRCP has asked us to evaluate:
  - How we could use an additional ~10,000 GPM of reservoir water delivered to Dworshak
  - If those changes could support a 1 Million Summer Chinook program at Dworshak
- No commitments have been made

# Clearwater Hatchery Reservoir Water Use

## Clearwater Fish Hatchery Chinook and Steelhead Loading on the Steelhead Bank 2/18/2011

Current CFS Used	West Bank				East Bank			Current CFS Used
	300'	200'	100'		100'	200'	300'	
0				1				0
1.6		Clear Creek Chinook 55,000	Selway Chinook 75,000	2	Selway Chinook 75,000	Selway Chinook 50,000		1.6
1.6		Clear Creek Chinook 55,000	Selway Chinook 75,000	3	Selway Chinook 75,000	Selway Chinook 50,000		1.6
1.6		Summer Chinook 50,000	Summer Chinook 75,000	4	Clear Creek Chinook 75,000	Clear Creek Chinook 50,000		1.6
1.6		Summer Chinook 50,000	Summer Chinook 75,000	5	Summer Chinook 75,000	Summer Chinook 25,000		1.6
1.6		Summer Chinook 50,000	Summer Chinook 75,000	6	Summer Chinook 75,000	Summer Chinook 50,000		1.6
2		Newsome Creek 61,500		7	Newsome Creek 61,500			2
2		Peasley Creek 70,000		8	Red House Hole 72,900			2
2		Peasley Creek 70,000		9	Red House Hole 72,900			2
2		Peasley Creek 70,000		10	Red House Hole 72,900			2
2		Peasley Creek 72,900		11	Peasley Creek 72,600			2
2		Peasley Creek 72,900		12	Peasley Creek 72,900			2
20								20
Spring Chinook		635,000						
Summer Chinook		600,000						
Steelhead		843,000						

# Developed an 'in-house' design based on the lessons learned, new options, and the following goals

- All Steelhead outdoor rearing production moved to Systems 1 & 2 on reservoir water to minimize risk of IHNV and to create room for LSRCP program request
- Do not exceed an additional ~10,000 gpm or 80% reuse rate of reservoir water (CO2 stripping only.....NO BIOFILTERS) with current density targets
- Minimize capital costs and reduce annual operational costs in the form of energy consumption
- Select fish tanks that provide the highest quality rearing environment and most easily treated effluent while simplifying the conversion from existing Burrows Ponds
- NPDES compliant hatchery discharge ALL systems

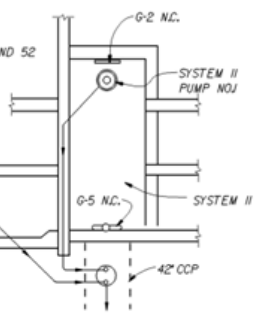




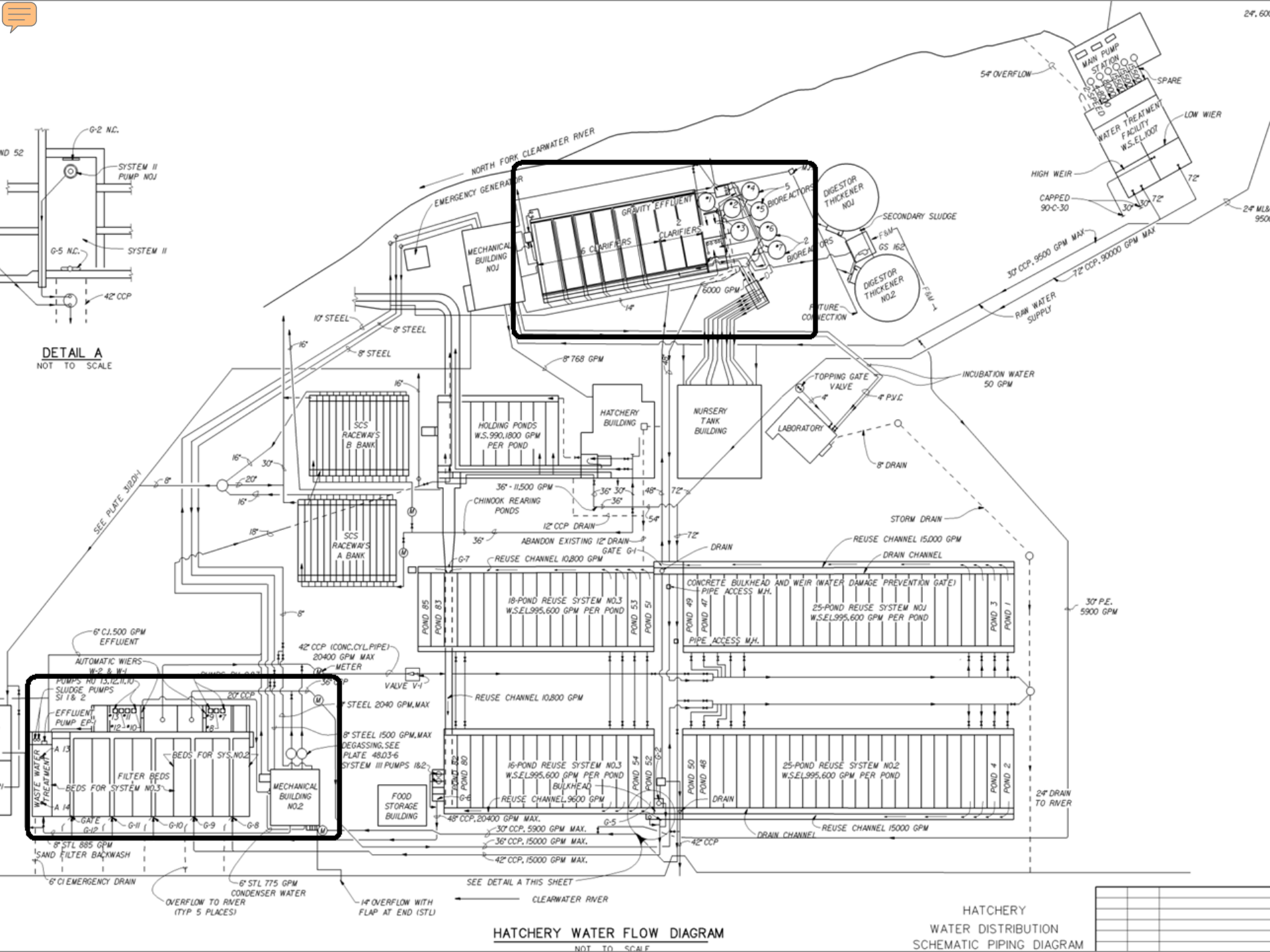
“a solids rotting, nutrient leaching,  
pathogen reservoir”

Brian Vinci – Freshwater Institute





DETAIL A  
NOT TO SCALE



HATCHERY WATER FLOW DIAGRAM  
NOT TO SCALE

HATCHERY  
WATER DISTRIBUTION  
SCHEMATIC PIPING DIAGRAM





# Dworshak National Fish Hatchery

## Facility Improvements

2010-12-22

Prepared For



U.S. Fish & Wildlife Service

Prepared by



PR Aqua Ltd.

1631 Harold Road

Nanaimo, BC, Canada V9X 1T4

Ph. 250-714-0141; Fx. 250-714-0171

[www.praqua.com](http://www.praqua.com)

- Developed an in-house design with 2 options that was reviewed by an independent 3<sup>rd</sup> party design team capable of identifying options we may have missed
- Consistent and extensive successful performance of partial-reuse system design, outfit, and commissioning on a commercial scale
- Successful partial-reuse system projects used specifically for Pacific Salmon stocks on our Northwest watersheds



[home](#) > [Projects](#)

## Projects

### PR Aqua Projects

Here are a few of the projects for which PR Aqua has provided solutions.

Please [contact us](#) if you have any questions, or would like to know how our knowledge, products and experience apply to your project.

#### In Progress

- Alaska Fish & Game Ruth Burnett & Anchorage Sport Fish Hatchery Cold Water Recirculating Facilities  
Fairbanks & Anchorage, AK, USA

#### Influent/Effluent Treatment

- Fisheries and Oceans Canada (DFO) - Pacific Biological Station (PBS) Freshwater Supply & Treatment Upgrade  
Nanaimo, BC, Canada
- Utah Division of Wildlife Resources - Mammoth Creek Hatchery Influent Treatment System for Exclusion of Whirling Disease  
Hatch, Utah, USA
- Wyoming Game & Fish - Wiqwam Rearing Station & Dubois Hatchery Rehabilitation Projects  
Tensleep & Dubois, Wyoming, USA

#### Recirculating Aquaculture Systems (RAS)

- Afikey Mayim - Beit Shean Valley 100 Tonne Tilapia Facility  
Beit Shean Valley, Israel
- Alaska Fish & Game - Fort Richardson & Fairbanks Hatchery Recirculation Aquaculture System Pilots  
Fort Richardson & Fairbanks, Alaska, USA
- Marine Harvest Canada - Big Tree Creek Hatchery Cold Water Recirculating Facility  
Campbell River, BC, Canada
- Marine Harvest Canada - Wolf Creek Hatchery Cold Water Recirculating Facility  
Prince Rupert, BC, Canada
- Marine Harvest Chile - Rio Copihue Hatchery Recirculation Aquaculture System Pilot  
Copihue, Chile, South America
- Redfish Ranch Tilapia Farm & Hatchery - 100 Tonne Tilapia Production Facility  
Courtenay, BC, Canada
- Salmones Multiexport - Puerto Fonck Hatchery Recirculating Aquaculture Facility  
Puerto Montt, Chile, South America
- Target Marine Products - Gray Creek Hatchery Recirculating Aquaculture Facility  
Sechelt, BC, Canada
- Utah Division of Wildlife Resources - Fisheries Experiment Station Warm Water Interim Hatchery Facility  
Logan, Utah, USA

#### Partial Reuse Aquaculture Systems (PRAS)

- Salmones Llanquihue - Llanquihue Hatchery Partial Reuse Aquaculture System  
Puerto Varas, Chile, South America
- Chelan P.U.D & WDF&W - Eastbank Fish Hatchery Partial Reuse Aquaculture System Pilot  
Wenatchee, WA, USA

#### Laboratory/Research

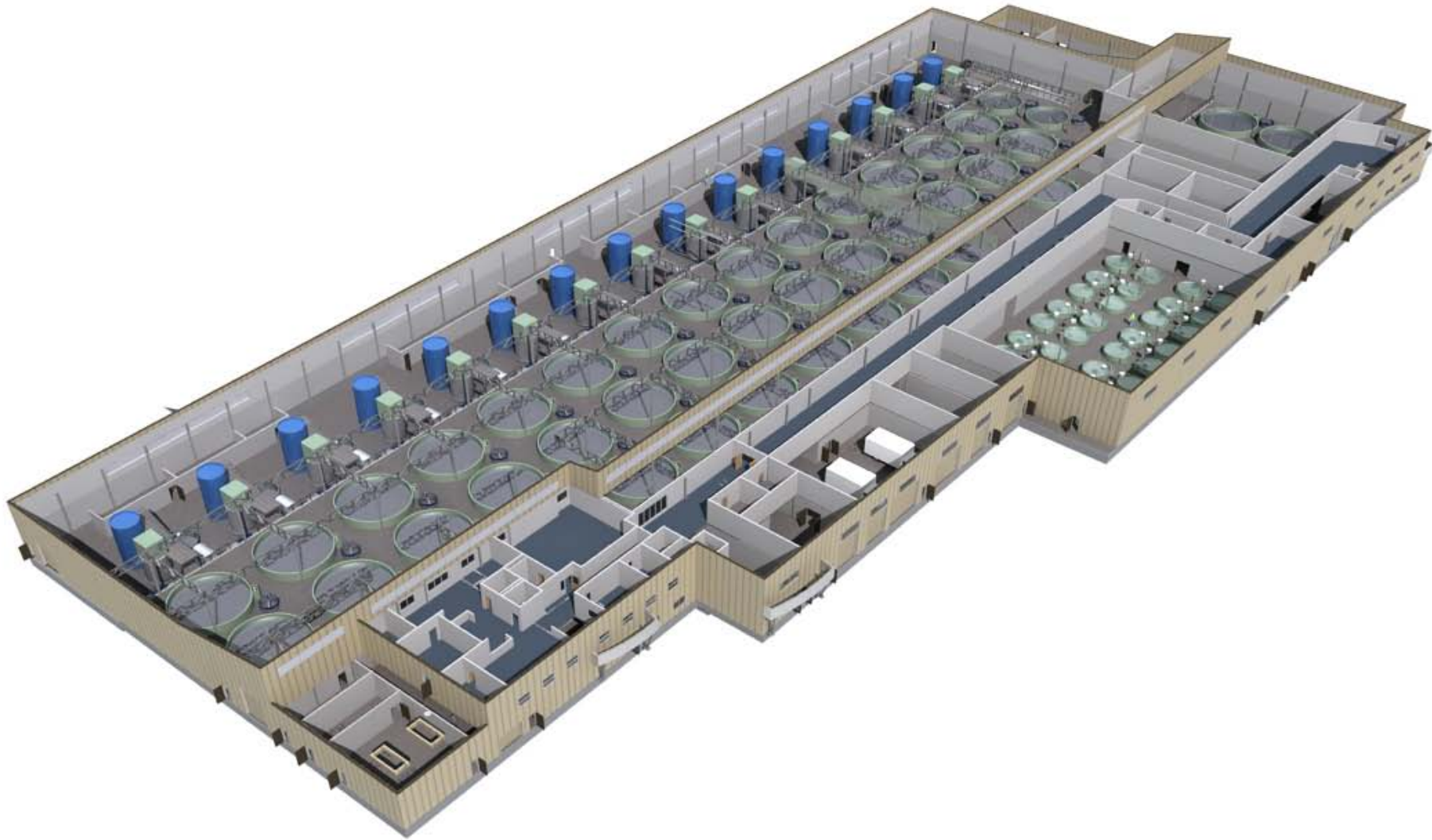
- Malaspina University-College - Center for Shellfish Research Recirculating Research Facility  
Nanaimo, BC, Canada
- USDA - National Conservation Training Center (NCTC) Skid Mounted Demonstration Recirculation Hatchery  
Shepherdstown, West Virginia, USA
- Oceanic Institute - Saltwater On-Grow Research Aquaculture Facility  
Waimanalo, Hawaii, USA
- University of Guelph - Alma Aquaculture Research Station Flow-through/Recirculating Research Laboratories  
Guelph, Ontario, Canada

Copyright 2006 PR Aqua

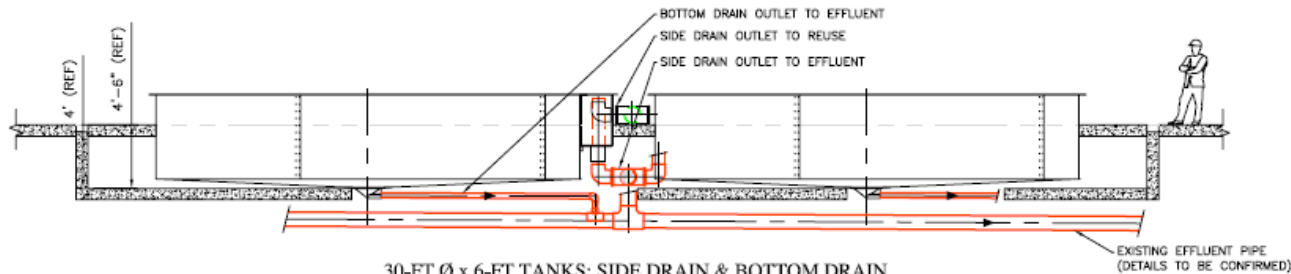
[Home](#) | [Contact Us](#) | [Disclaimer](#) | [Privacy Policy](#)



# Anchorage Hatchery Design & Outfit





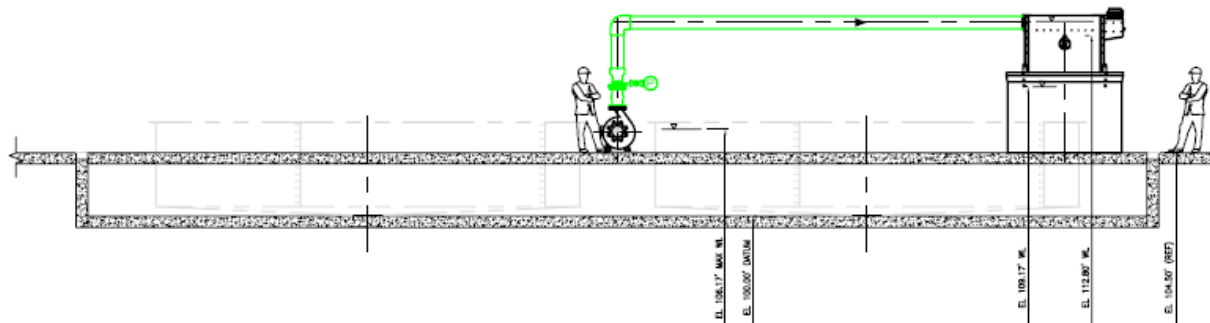


30-FT Ø x 6-FT TANKS: SIDE DRAIN & BOTTOM DRAIN

SCALE: 1/8" = 1'-0"

NOTES:

1. REFER TO PLAN VIEW FOR ORIENTATIONS.
2. SIDE DRAINS ON BOTH TANKS ARE SIMILAR (RIGHT TANK ASSEMBLY NOT SHOWN).
3. LEVEL CONTROL STANDPIPE ON BOTTOM DRAIN FLOW NOT SHOWN.



30-FT Ø x 6-FT TANKS: TREATMENT

SCALE: 1/8" = 1'-0"

CONCEPTUAL

FOR INFORMATION ONLY  
NOT FOR CONSTRUCTION

NOTES:

1. DIMENSIONS ARE IN FEET & INCHES. DIMENSIONS MARKED "REF" ARE REFERENCE DIMENSIONS AND ARE TO BE CONFIRMED BEFORE CONSTRUCTION.

NO.	DATE	REVISION
1	21DEC10	ISSUED FOR INFORMATION

DRAWING IS ISSUED AS 280x430 MM [11"x17"]. IF LINE SHOWN ABOVE IS NOT 25.4 MM [1"] LONG, ACTUAL SCALE DIFFERS FROM STATED SCALE.

ALL INFORMATION CONTAINED IN OR DISCLOSED BY THIS DOCUMENT IS CONSIDERED CONFIDENTIAL AND PROPRIETARY OF PR AQUA LTD. ALL DESIGN, MANUFACTURING, USE, REPRODUCTION AND ALL SALES RIGHTS ARE EXPRESSLY RESERVED BY AND TO PR AQUA LTD. AND CONSTRUCTION OF THIS INFORMATION TO OTHERS IS PROHIBITED WITHOUT THE PRIOR WRITTEN CONSENT OF PR AQUA LTD.

SEAL



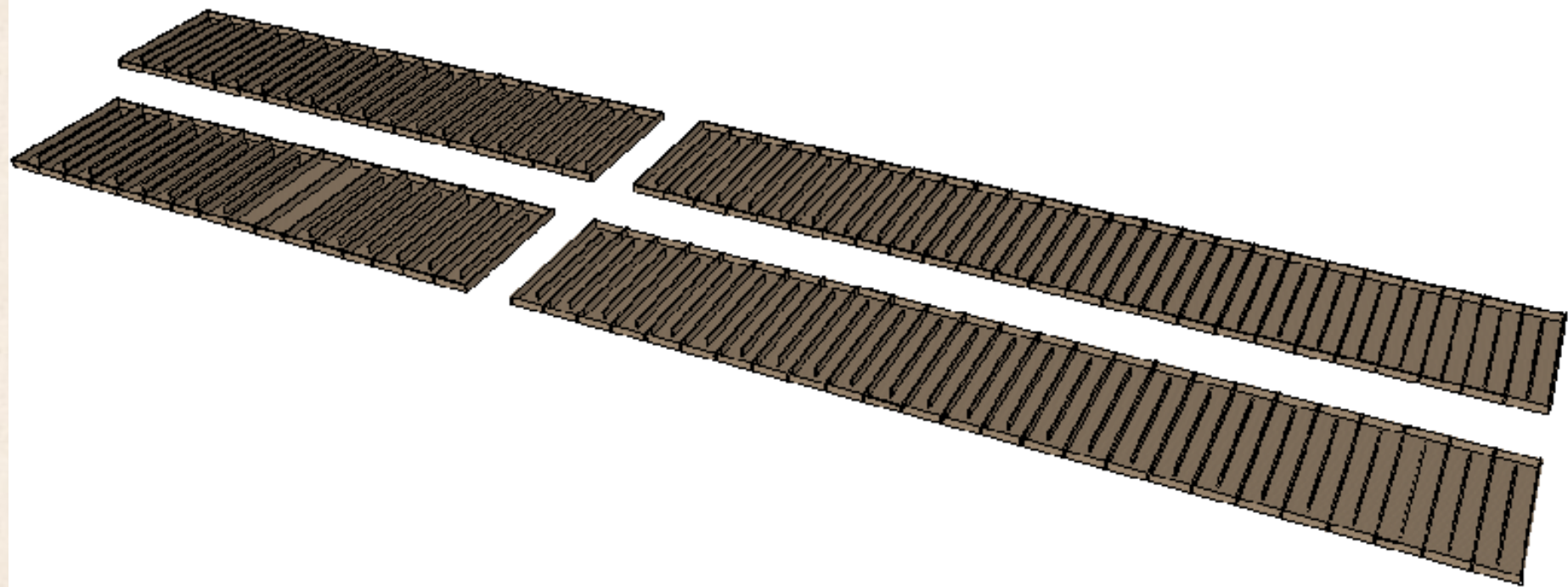
PR Aqua Ltd.  
1835 Harold Road  
Nanaimo, BC, Canada  
V9X 1T4  
PH: (250)714-0141, FAX: (250)714-0171

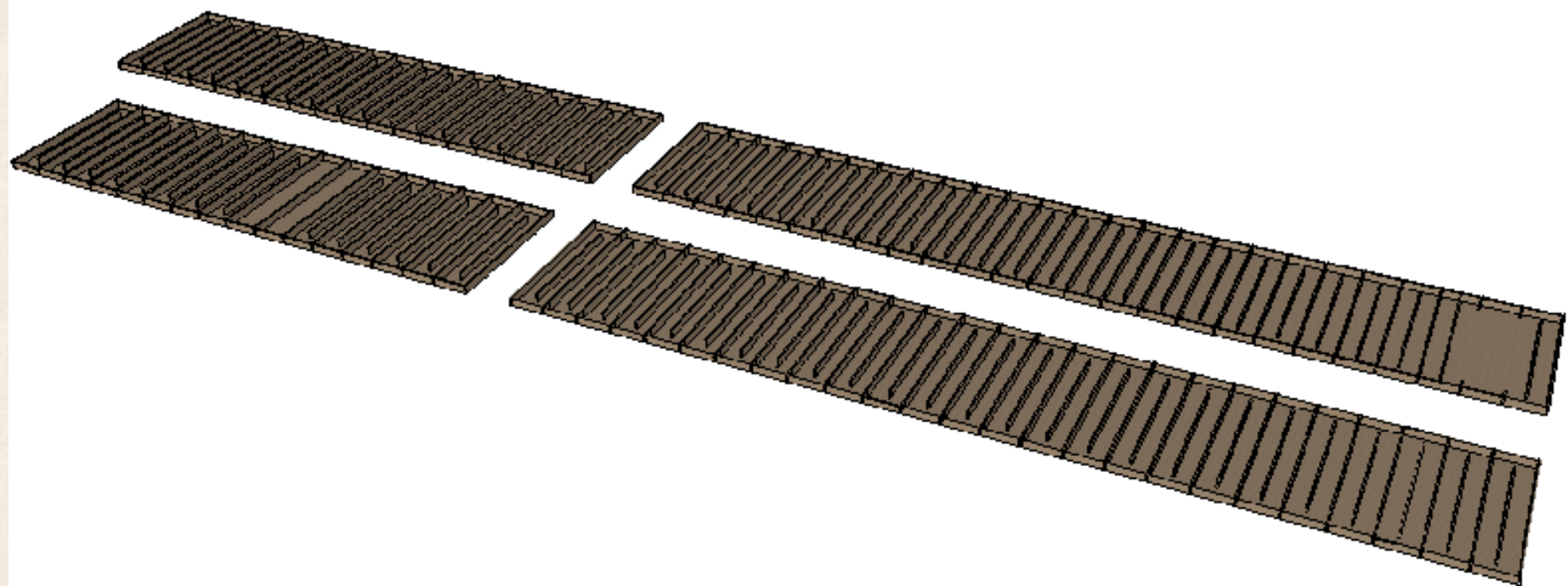
U.S. FISH & WILDLIFE SERVICE  
DWORSHAK FISHERIES COMPLEX  
BURROUGHS POND RETROFIT  
30-FT Ø x 6-FT TANK - SECTIONS

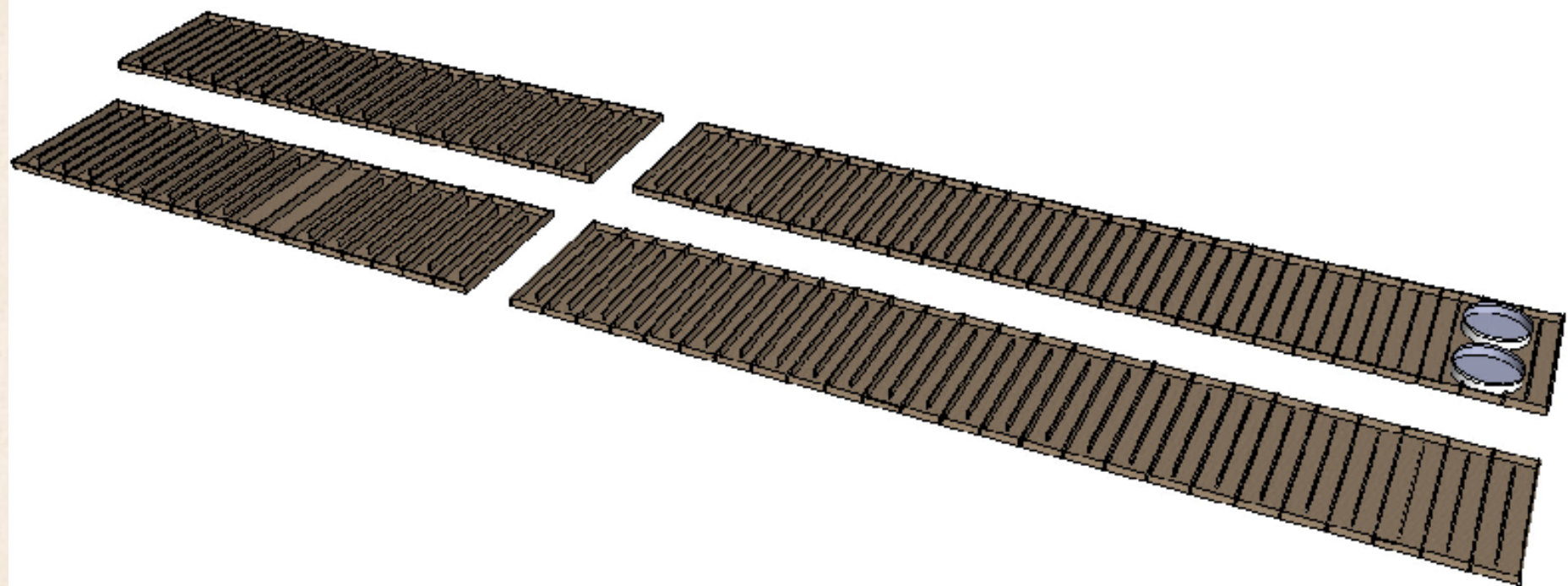
DESIGNED	DRAWN	CHECKED
KDH	KCG	
DATE	SCALE	APP'D
15DEC10	AS NOTED	
DWG. NO.	723-301	REV: A

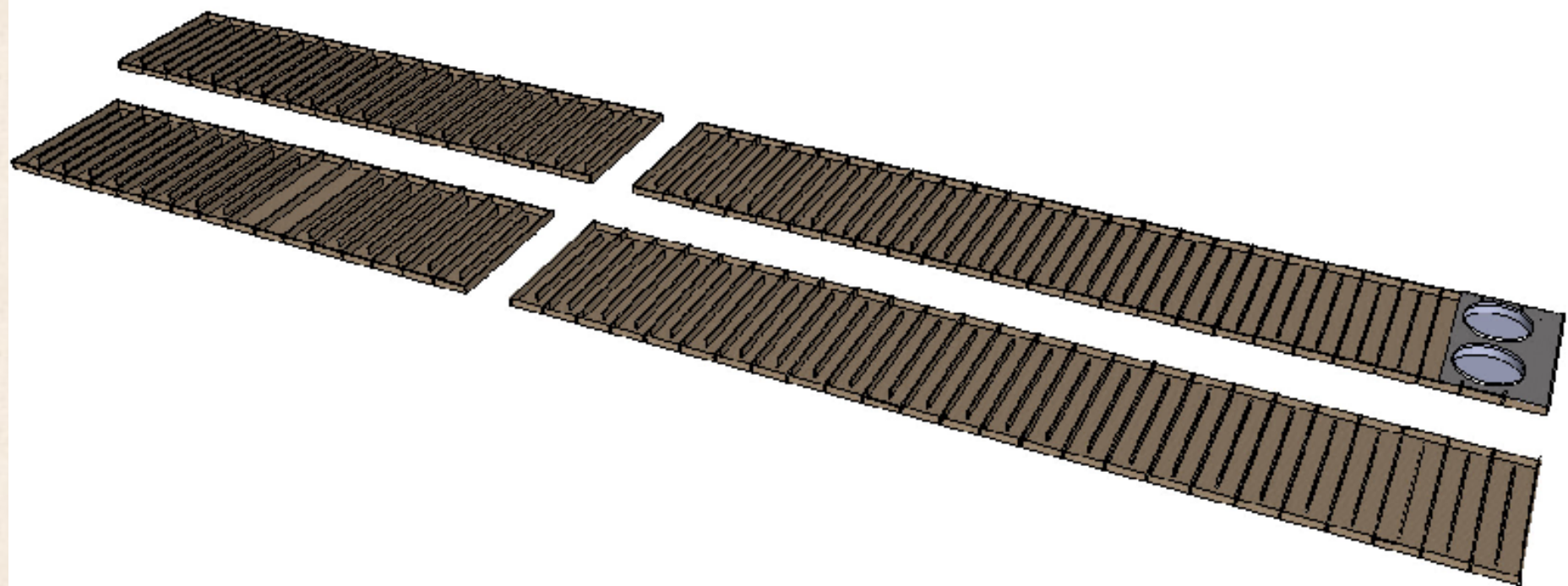


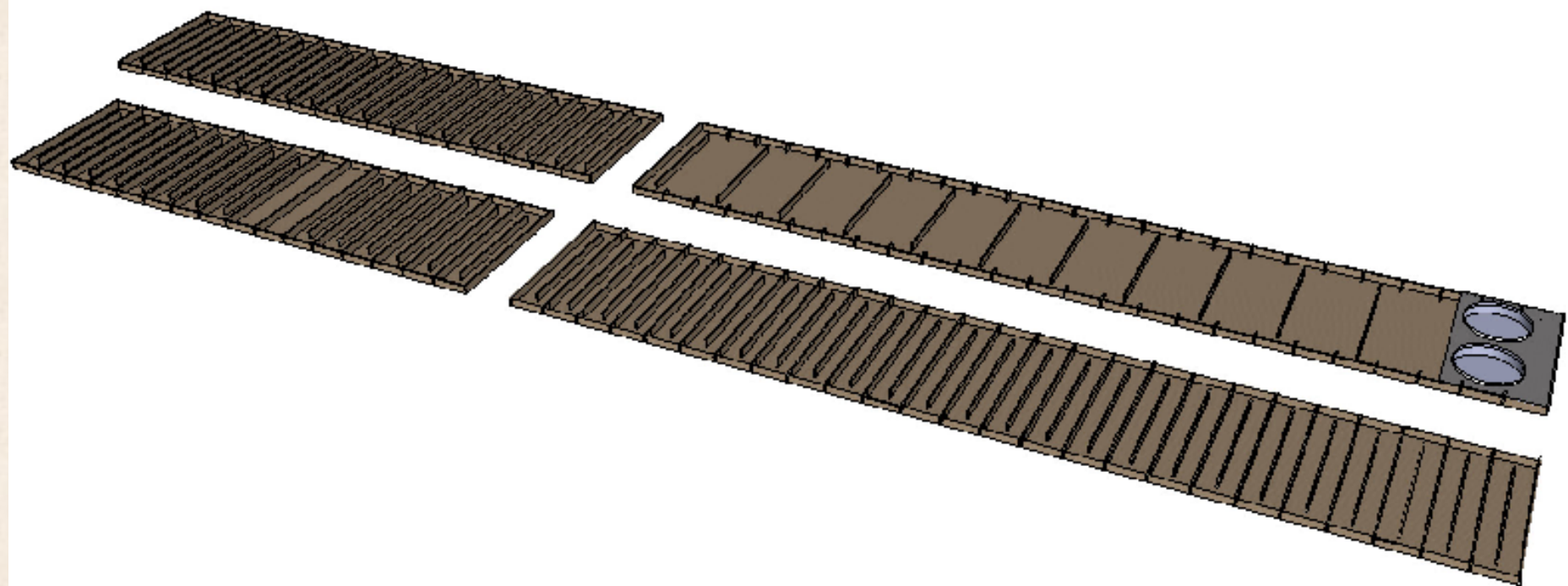


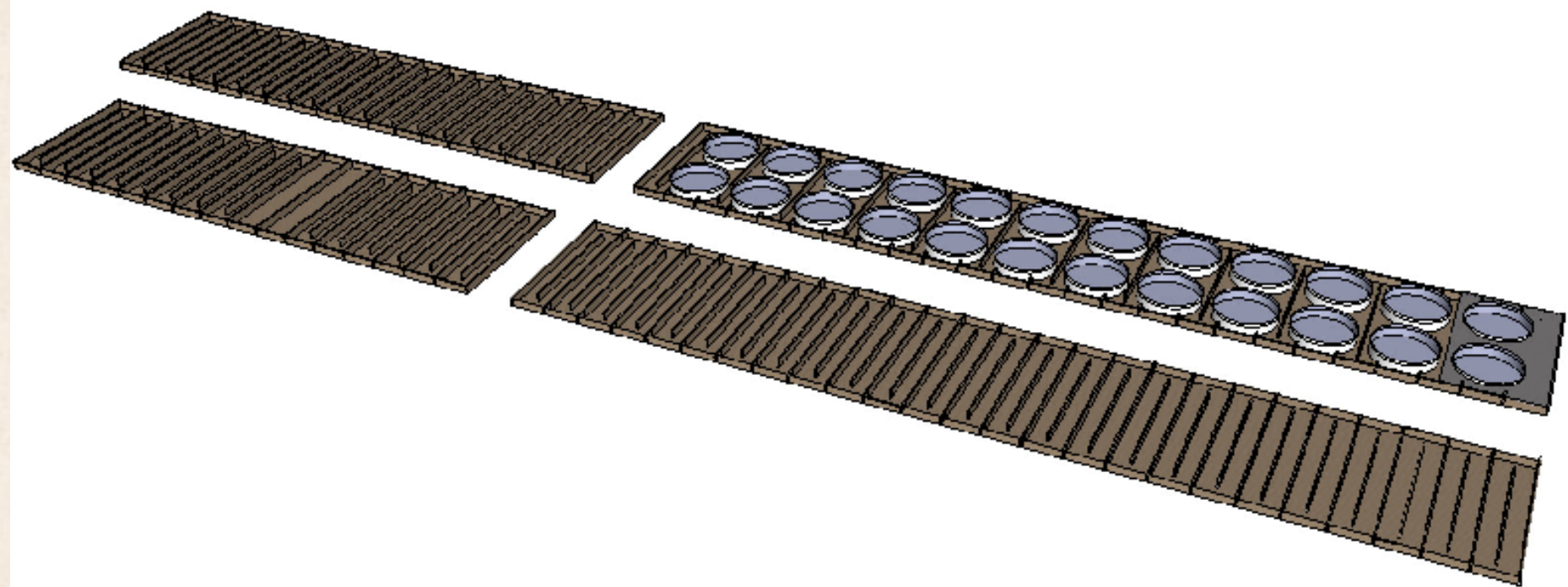


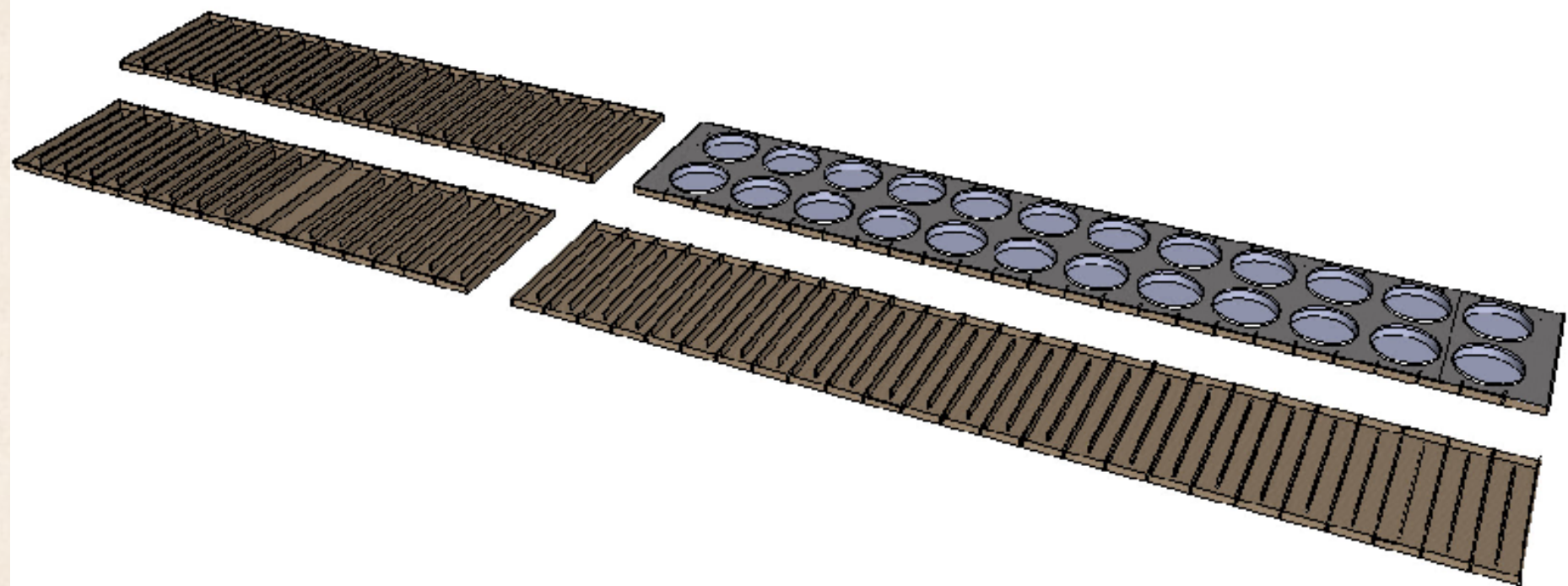


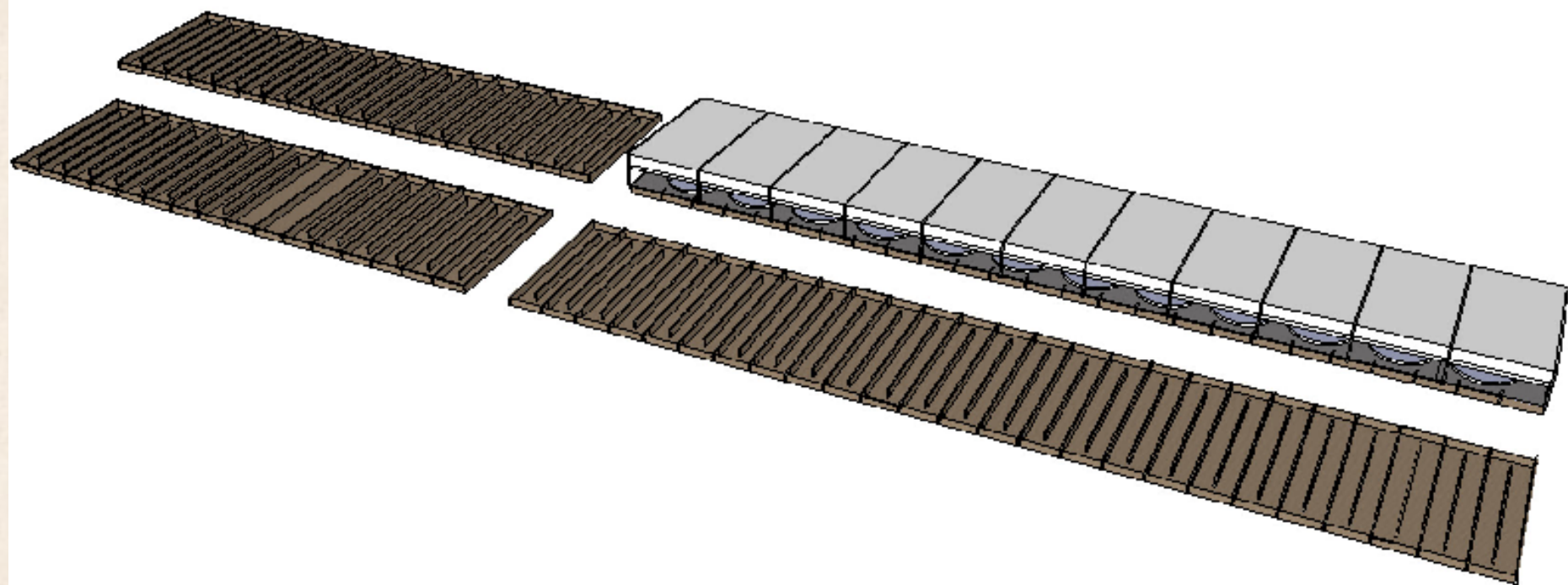


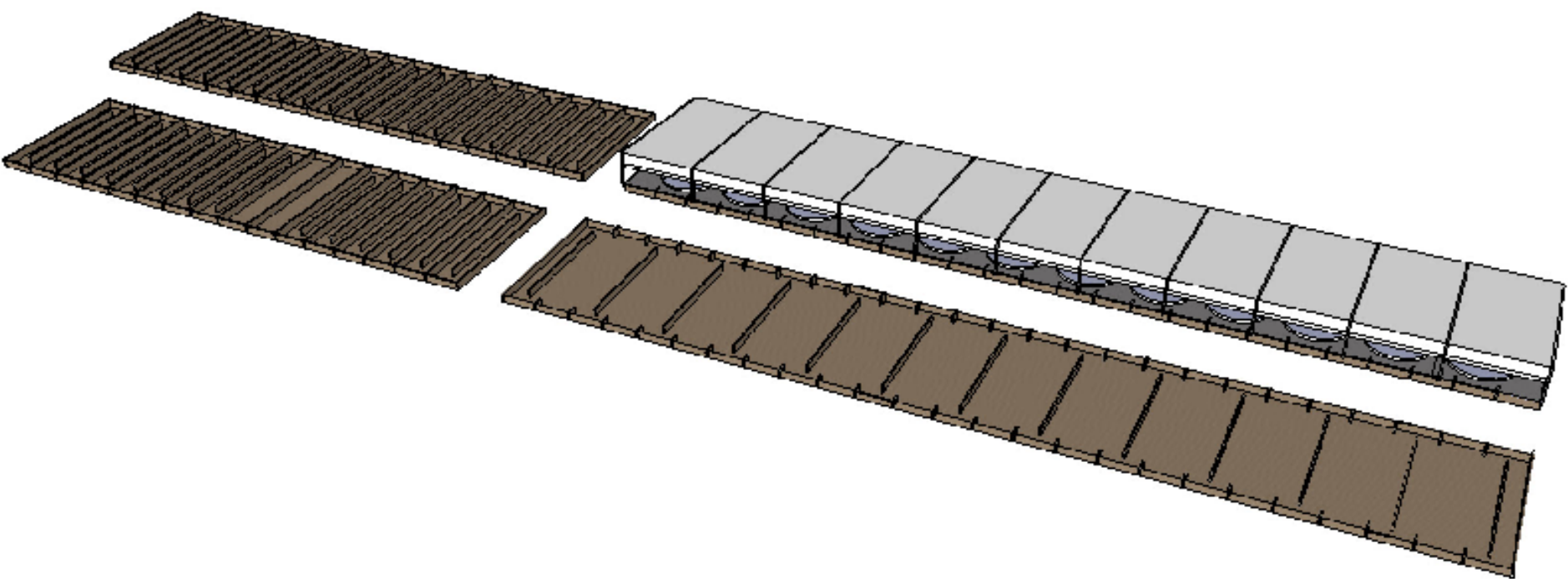


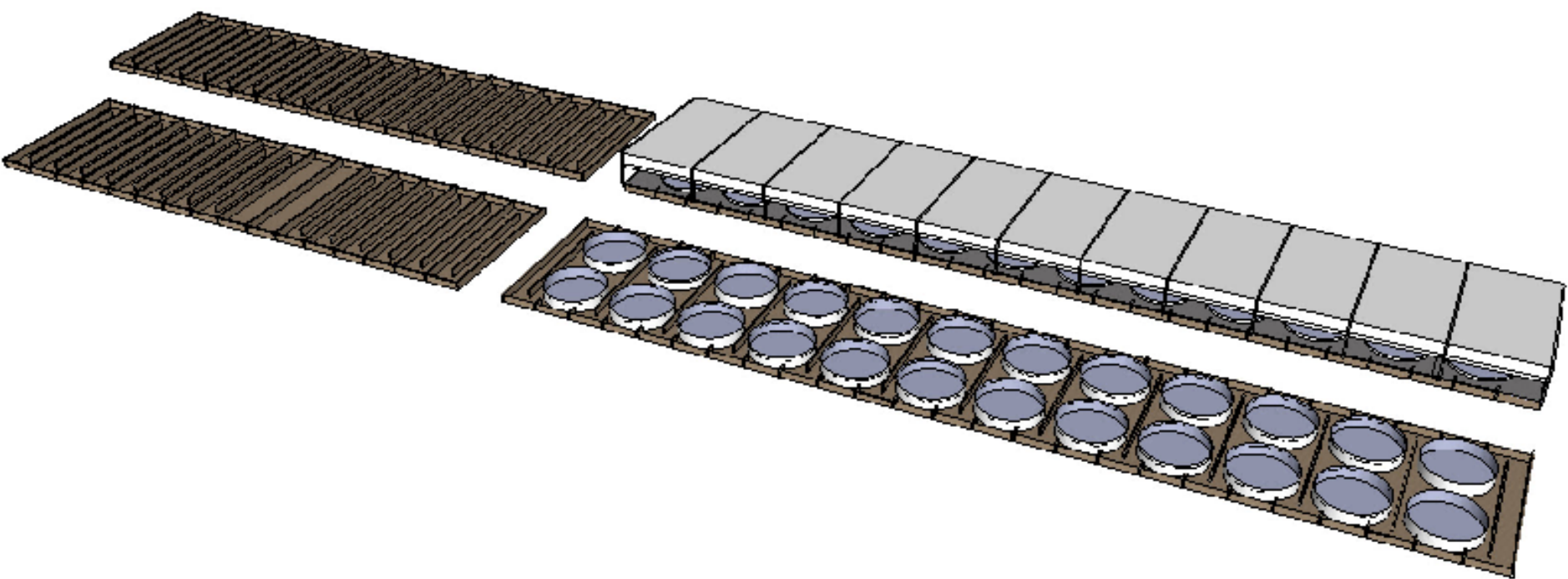


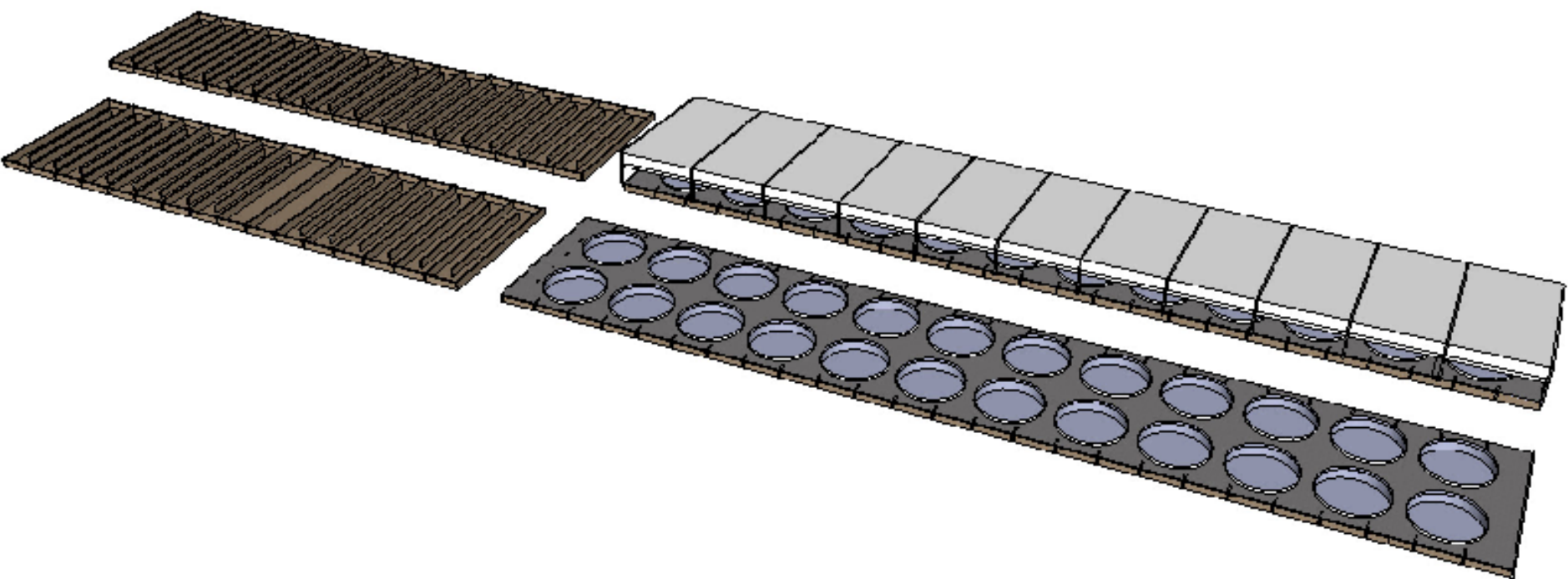


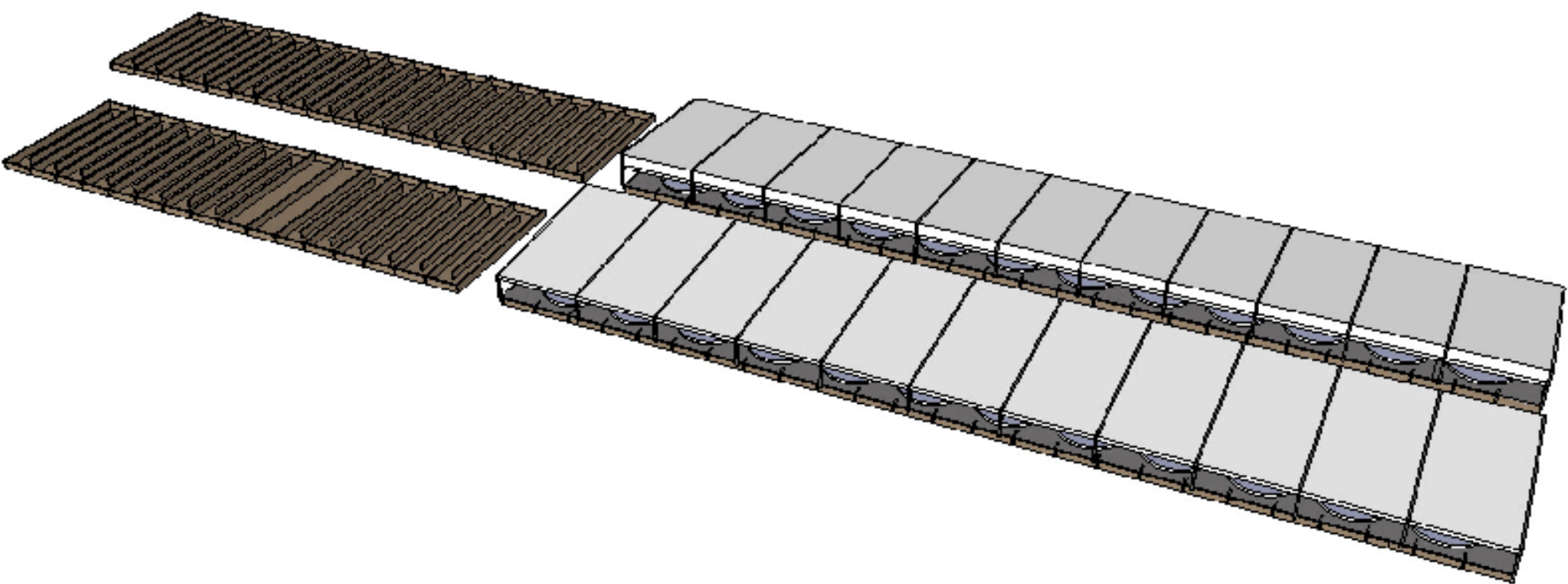


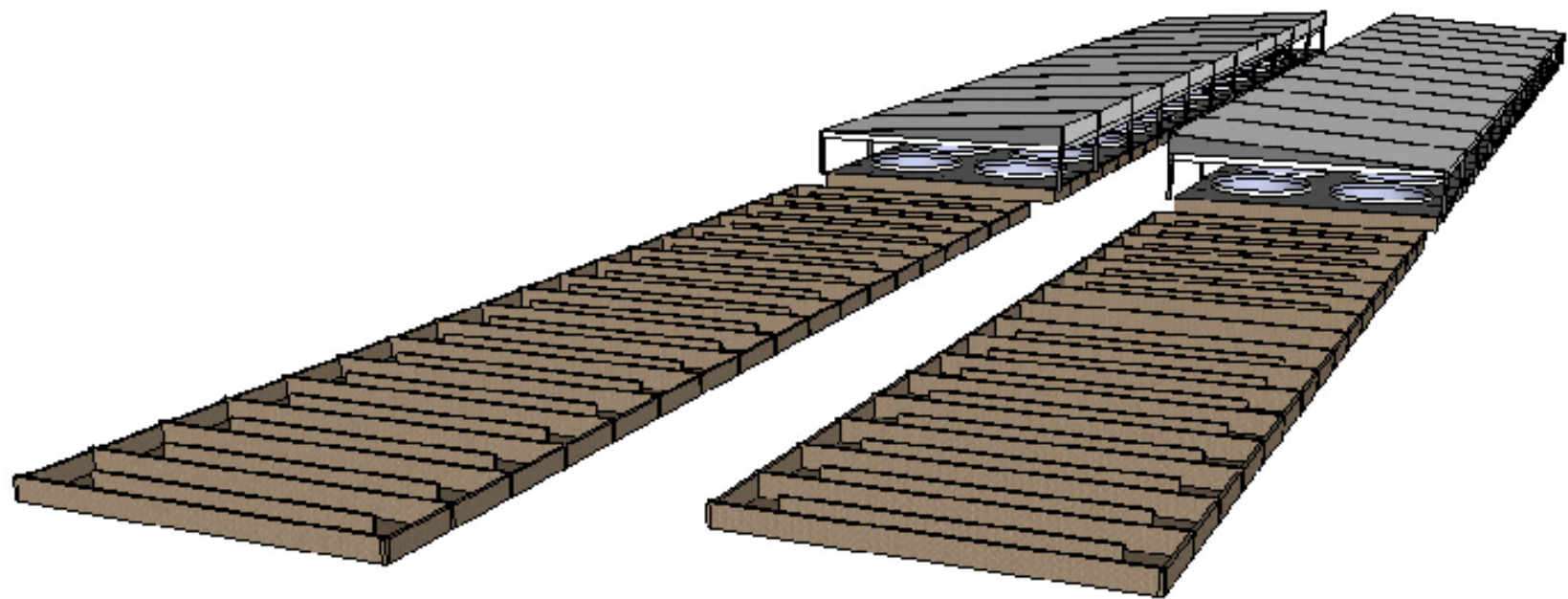


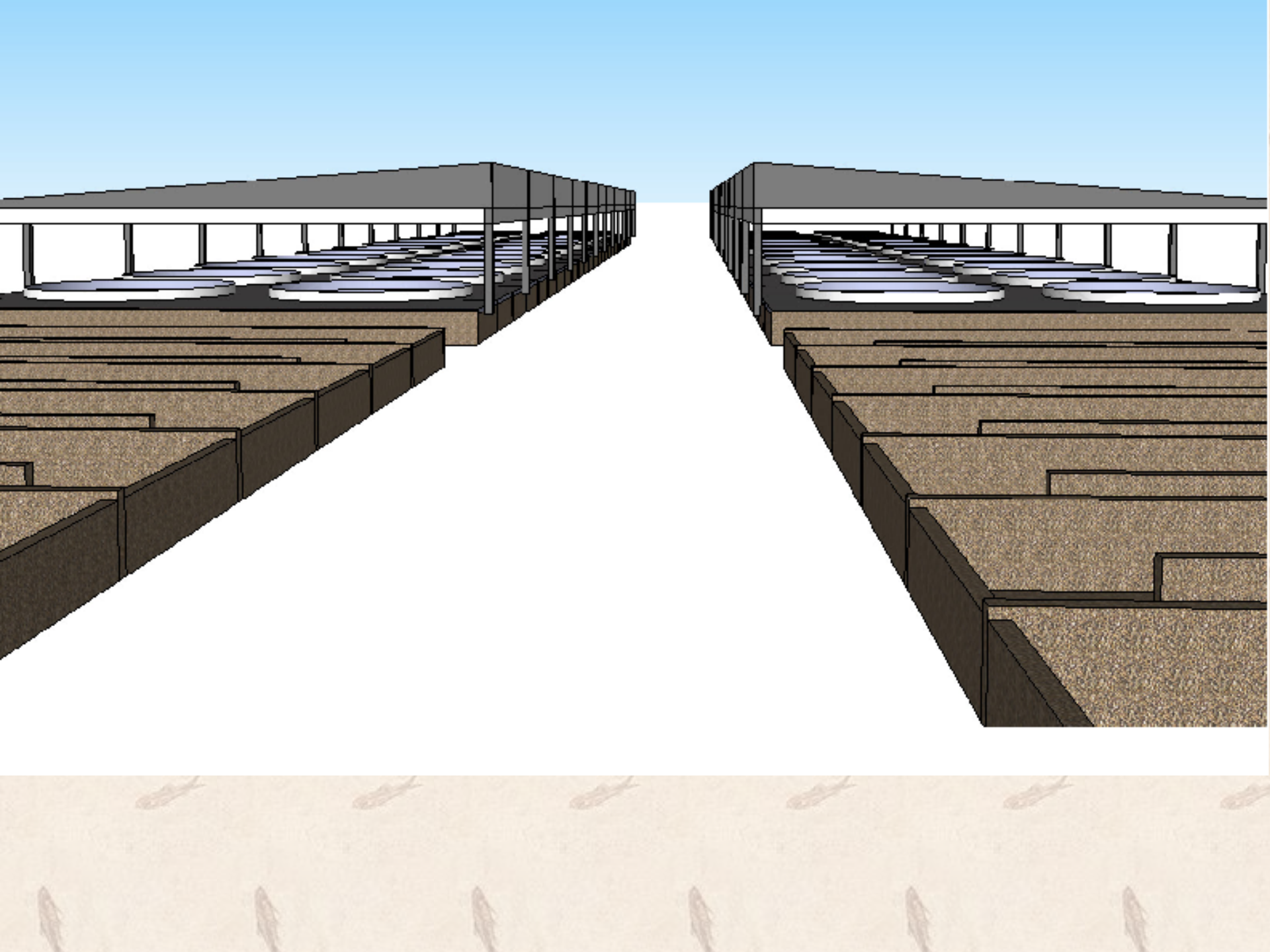






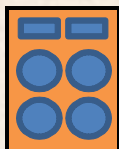
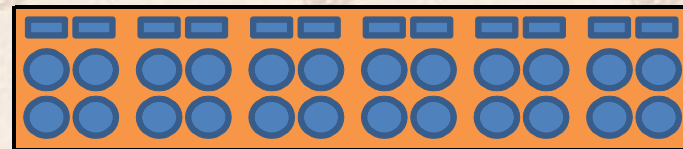
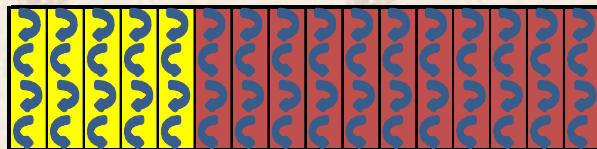
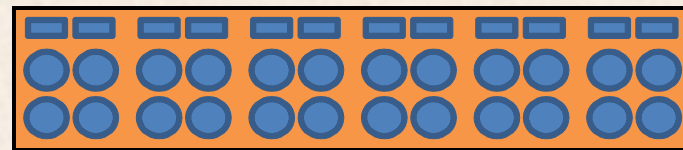
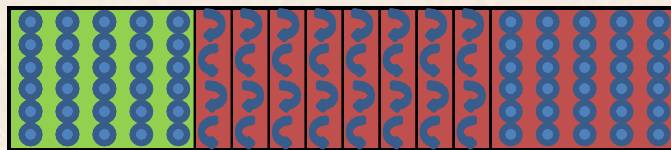
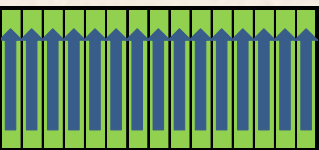
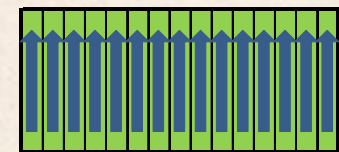




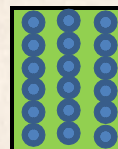


# Did we meet our design goals?

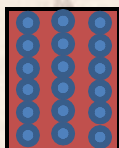
- All Steelhead outdoor rearing production moved to Systems 1 & 2 on reservoir water to minimize risk of IHNV and to create room for LSRCP program request



2.1 Million Steelhead @ 1.9 lbs/cu ft and 5.8 fpp  
(48) 30' x 6' circular tanks - 24 separate reuse systems  
10,000 gpm Reservoir water from System 1 reuse  
43,700 fish/tank - 208 gpm/tank



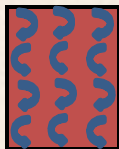
1.65 Million Spring Chinook @ 2.0 lbs/cu ft and 100 fpp  
(30) 10' x 4' circular tanks  
3000 gpm River water  
~55,000 fish/tank - 100 gpm/tank



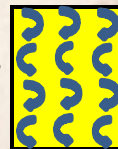
1.65 Million Summer Chinook @ 2.0 lbs/cu ft and 100 fpp  
(30) 10' x 4' circular tanks  
3000 gpm River water  
55,000 fish/tank - 100 gpm/tank



1.5 Million Spring Chinook @ 1.3 lbs/cu ft and 20 fpp  
(30) 8' x 80' x 3' raceways  
18,000 gpm River water  
~50,000 fish/raceway - 600 gpm/raceway



1.5 Million Summer Chinook @ 1.3 lbs/cu ft and 20 fpp  
(18) Burrows Ponds converted to Mixed Cells or Circulars  
12,600 gpm River water  
78,000 fish/cell - 600 gpm/cell



600,000 Coho @ 2.0 lbs/cu ft and 20 fpp  
(5) Burrows Ponds converted to Mixed Cells or Circulars  
3000 gpm River water  
120,000 fish/cell - 600 gpm/cell

# Maintained Current Density Targets

		OR						
		Spring Chinook		Spring Chinook		Summer Chinook		
		Steelhead Program	Start-Up	Start-Up	Grow-out at 2.5' deep	Grow-out Extra Dam Board	Summer Chinook Grow-Out	Coho
Production Goal		2,100,000	1,650,000	1,650,000	1,250,000	1,500,000	1,500,000	600,000
Size at Release								
fish per pound		5.8	100	100	20	20	20	20
grams		78	5	5	23	23	23	23
Target Loading Density								
pounds/cubic foot		1.9	2.0	2	1.3	1.3	1.3	2
kilos/cubic meter		30.4	32.0	32.0	20.8	20.8	20.8	32.0
Tank Style		Circular	Circular	Circular	Raceway	Raceway	Mixed Cell	Mixed Cell
Dimensions		30' x 6'	10' x 4'	10' x 4'	8' x 80' x 2.5'	8' x 80' x 3'	or	or
Diameter		30	10	10			Mod Circular	Mod Circular
Rearing Height		5.5	3.5	3.5				
Volume in cubic feet		3887.7	274.9	274.9	1600	1920	3000	3000
Volume in cubic meters		110.1	7.8	7.8	45.3	54.4	85.0	85.0
Number of Fish per Unit		42842.7	54977.9	54977.9	41600.0	49920.0	78000.0	120000.0
Number of Rearing Units Needed		49.0	30.0	30.0	30.0	30.0	19.2	5.0
Existing Units OR Number of New								
Units that will Fit		48	30	30	30	30	18	5
Adjusted Number of Fish at Target								
Density Setpoint to Maximize Production		-43551.1	-663.9	-663.9	-2000.0	-2400.0	-96000.0	0.0

# Did we meet our design goals?



All Steelhead outdoor rearing production moved to Systems 1 & 2 on reservoir water to minimize risk of IHNV and to create room for LSRCP program request

- Do not exceed an additional ~10,000 gpm or 80% reuse rate of reservoir water (CO2 stripping only.....NO BIOFILTERS) with current density targets

# Hatchery Water Use

				Total Reservoir Water Flow		Spring & Summer (60) Chinook 10'x4' Circulars	Summer (18) Chinook Mixed Cells or Circulars	(5) Coho Mixed Cells or Circulars		Spring A-Bank Spring Chinook	B-Bank Spring Chinook		Total River Water Flow
	Nursery	Systems 1 & 2			Ladder								
January	1500	10000		11500	10000		10,800	3000		9000	9000		41800
February	3000	10000		13000	10000		10,800	3000		9000	9000		41800
March	4500	10000		14500	10000	6000	10,800	3000		9000	9000		47800
April	5260	10000		15260	10000	6000							16000
May	5260	5000		10260		6000		3000					9000
June	4500	5000		9500	10000		5,400	3000		9000			27400
July	3000	5000		8000	10000		5,400	3000		9000			27400
August	1500	5000		6500	10000		10,800	3000		9000	9000		41800
September	0	10000		10000	10000		10,800	3000		9000	9000		41800
October	0	10000		10000	10000		10,800	3000		9000	9000		41800
November	0	10000		10000	10000		10,800	3000		9000	9000		41800
December	0	10000		10000	10000		10,800	3000		9000	9000		41800

# Did we meet our design goals?



All Steelhead outdoor rearing production moved to Systems 1 & 2 on reservoir water to minimize risk of PNNV and to create room for LSRCF program request



Do not exceed an additional ~10,000 gpm or 80% reuse rate of reservoir water (CO<sub>2</sub> stripping only.....NO BIOFILTERS) with current density targets

- Minimize capital costs and reduce annual operational costs in the form of energy consumption



## Section 4

# Analysis

---

The following analyses focus on Alternative 2 as described above.

## 4.1 Opinion of Probable Cost (OPC)

**Table 3: Opinion of probable construction cost.**


Item #	Item	Total
1	CULTURE	\$ 1,153,776
2	PUMPING	\$ 368,000
3	GAS TRANSFER	\$ 423,360
4	MONITORING, CONTROL, AND ALARMS	\$ 192,000
5	PLUMBING	\$ 240,000
6	LABOUR	\$ 1,186,000
7	SITE	\$ 170,000
8	CONCRETE	\$ 90,000
9	ELECTRICAL	\$ 75,000
10	ENGINEERING	\$ 175,000
11	FREIGHT	\$ 40,000
12	CONTINGENCY	\$ 513,350
Grand Total		\$ 4,626,486

**Table 4: Energy Cost: Current Operating Scenario**

Month	Power: Reuse Pumps (HP)	Power Reservoir Pumps (HP)	Power: River Pumps (HP)	Power: Total (HP)	Total Energy Use (kWh)	Total Energy Cost (@\$0.08/kWh)
Jan	0	125	1250	1375	762,851	\$61,028
Feb	0	125	1250	1375	689,027	\$55,122
Mar	0	125	1250	1375	762,851	\$61,028
Apr	0	0	1500	1500	805,356	\$64,428
May	0	125	500	625	346,751	\$27,740
Jun	0	125	500	625	335,565	\$26,845
Jul	0	250	500	750	416,101	\$33,288
Aug	0	250	1000	1250	693,501	\$55,480
Sep	0	125	1250	1375	738,243	\$59,059
Oct	0	125	1250	1375	762,851	\$61,028
Nov	0	125	1250	1375	738,243	\$59,059
Dec	0	125	1250	1375	762,851	\$61,028
Total					7,814,190	\$625,135

**Table 5: Energy Cost: Proposed operating scenario**

Month	Power: Reuse Pumps (HP)	Power Reservoir Pumps (HP)	Power: River Pumps (HP)	Power: Total (HP)	Total Energy Use (kWh)	Total Energy Cost (@\$0.08/kWh)
Jan	144	80	500	724	401,676	\$32,134
Feb	144	80	500	724	362,804	\$29,024
Mar	144	80	500	724	401,676	\$32,134
Apr	144	80	500	724	388,718	\$31,097
May	144	80	500	724	401,676	\$32,134
Jun	144	80	500	724	388,718	\$31,097
Jul	144	80	500	724	401,676	\$32,134
Aug	144	80	500	724	401,676	\$32,134
Sep	144	80	500	724	388,718	\$31,097
Oct	144	80	500	724	401,676	\$32,134
Nov	144	80	500	724	388,718	\$31,097
Dec	144	80	500	724	401,676	\$32,134
Total					4,729,408	\$378,353



# Did we meet our design goals?



All Steelhead outdoor rearing production moved to Systems 1 & 2 on reservoir water to minimize risk of HNV and to create room for LSRCP program request



Do not exceed an additional ~10,000 gpm or 80% reuse rate of reservoir water (CO2 stripping only.....NO BIOFILTERS) with current density targets



Minimize capital costs and reduce annual operational costs in the form of energy consumption

- Select fish tanks that provide the highest quality rearing environment and most easily treated effluent while simplifying the conversion from existing Burrows Ponds



[home](#) > [Projects](#)

## Projects

### PR Aqua Projects

Here are a few of the projects for which PR Aqua has provided solutions.

Please [contact us](#) if you have any questions, or would like to know how our knowledge, products and experience apply to your project.

#### In Progress

- 
[Alaska Fish & Game Ruth Burnett & Anchorage Sport Fish Hatchery Cold Water Recirculating Facilities](#)  
Fairbanks & Anchorage, AK, USA

#### Influent/Effluent Treatment

- 
[Fisheries and Oceans Canada \(DFO\) - Pacific Biological Station \(PBS\) Freshwater Supply & Treatment Upgrade](#)  
Nanaimo, BC, Canada
- 
[Utah Division of Wildlife Resources - Mammoth Creek Hatchery Influent Treatment System for Exclusion of Whirling Disease](#)  
Hatch, Utah, USA
- 
[Wyoming Game & Fish - Wiquam Rearing Station & Dubois Hatchery Rehabilitation Projects](#)  
Tensleep & Dubois, Wyoming, USA

#### Recirculating Aquaculture Systems (RAS)

- 
[Afikey Mayim - Beit Shean Valley 100 Tonne Tilapia Facility](#)  
Beit Shean Valley, Israel
- 
[Alaska Fish & Game - Fort Richardson & Fairbanks Hatchery Recirculating Aquaculture System Pilots](#)  
Fort Richardson & Fairbanks, Alaska, USA
- 
[Marine Harvest Canada - Big Tree Creek Hatchery Cold Water Recirculating Facility](#)  
Campbell River, BC, Canada
- 
[Marine Harvest Canada - Wolf Creek Hatchery Cold Water Recirculating Facility](#)  
Prince Rupert, BC, Canada
- 
[Marine Harvest Chile - Rio Copihue Hatchery Recirculation Aquaculture System Pilot](#)  
Copihue, Chile, South America
- 
[Redfish Ranch Tilapia Farm & Hatchery 100 Tonne Tilapia Production Facility](#)  
Courtenay, BC, Canada
- 
[Salmones Multiexport - Puerto Fonck Hatchery Recirculating Aquaculture Facility](#)  
Puerto Montt, Chile, South America
- 
[Target Marine Products - Gray Creek Hatchery Recirculating Aquaculture Facility](#)  
Sechelt, BC, Canada
- 
[Utah Division of Wildlife Resources - Fisheries Experiment Station Warm Water Interim Hatchery Facility](#)  
Logan, Utah, USA

#### Partial Reuse Aquaculture Systems (PRAS)

- 
[Salmones Llanquihue - Llanquihue Hatchery Partial Reuse Aquaculture System](#)  
Puerto Varas, Chile, South America
- 
[Chelan P.U.D & WDF&W - Eastbank Fish Hatchery Partial Reuse Aquaculture System Pilot](#)  
Wenatchee, WA, USA

#### Laboratory/Research

- 
[Malaspina University-College - Center for Shellfish Research Recirculating Research Facility](#)  
Nanaimo, BC, Canada
- 
[USDA - National Conservation Training Center \(NCTC\) Skid Mounted Demonstration Recirculation Hatchery](#)  
Shepherdstown, West Virginia, USA
- 
[Oceanic Institute Saltwater On-Grow Research Aquaculture Facility](#)  
Waimanalo, Hawaii, USA
- 
[University of Guelph - Alma Aquaculture Research Station Flow-through/Recirculating Research Laboratories](#)  
Guelph, Ontario, Canada

Copyright 2006 PR Aqua

[Home](#) | [Contact Us](#) | [Disclaimer](#) | [Privacy Policy](#)



# Did we meet our design goals?



All Steelhead outdoor rearing production moved to Systems 1 & 2 on reservoir water to minimize risk of HANV and to create room for LSRCP program request



Do not exceed an additional ~10,000 gpm or 80% reuse rate of reservoir water (CO2 stripping only.....NO BIOFILTERS) with current density targets



Minimize capital costs and reduce annual operational costs in the form of energy consumption



Select fish tanks that provide the highest quality rearing environment and most easily treated effluent while simplifying the conversion from existing Burrows Ponds

- NPDES compliant hatchery discharge ALL systems

# TMDL Control

- Overall waste capture efficiency of culture system
  - ✓ depends upon type of reuse systems!

	TSS capture efficiency
serial-reuse raceway systems	25–50%
partial-reuse tank systems	80%
fully-recirculating tank systems	> 97%

# Did we meet our design goals?

- ✓ All Steelhead outdoor rearing production moved to Systems 1 & 2 on reservoir water to minimize risk of HNV and to create room for LSRCP program request
- ✓ Do not exceed an additional ~10,000 gpm or 80% reuse rate of reservoir water (CO2 stripping only.....NO BIOFILTERS) with current density targets
- ✓ Minimize capital costs and reduce annual operational costs in the form of energy consumption
- ✓ Select fish tanks that provide the highest quality rearing environment and most easily treated effluent while simplifying the conversion from existing Burrows Ponds
- ✓ NPDES compliant hatchery discharge ALL systems

# Potential Roadblocks

- USACE determines it will not allow additional water flow through reservoir lines
- BPA determines it will not support additional water bypassing main turbines at dam
- LSRCP determines Clearwater Hatchery is a better location for the program or doesn't implement a Summer Chinook Program at full program level
  - Conversion of Systems 1 and 2 to circular tanks on reuse without additional reservoir water year-round still represents a significant increase in operational efficiency, decreased deferred maintenance costs and improved risk management of fish health as demonstrated in 2010/2011
- No funding for modifications at Dworshak from any agency
  - Potentially result in a reduction in next year's steelhead production goal without near-term modifications to System 3 effluent system

# Additional Energy Saving Opportunities at Dworshak



- Variable Frequency Drives (VFD's) for Main Pumps
  - 250 hp
  - 15,000 gpm
  - Fixed Flow Rate

# Why Fixed Flow is Expensive



	TOTAL		# of	Total	Unnecessary	Unnecessary Monthly	Value at
	Reservoir	River	Running	Flow	Flow	kwh Consumption	\$0.08/kwh
January	5265	67470	5	75000	7530	67408.56	\$5,392.68
February	5265	70210	5	75000	4790	42880.08	\$3,430.41
March	5265	74260	5	75000	740	6624.48	\$529.96
April	5265	76800	6	90000	13200	118166.4	\$9,453.31
May	8820	29600	2	30000	400	3580.8	\$286.46
June	9930	21200	2	30000	8800	78777.6	\$6,302.21
July	10200	21200	2	30000	8800	78777.6	\$6,302.21
August	10200	57870	4	60000	2130	19067.76	\$1,525.42
September	5265	65805	5	75000	9195	82313.64	\$6,585.09
October	5265	67535	5	75000	7465	66826.68	\$5,346.13
November	5265	67410	5	75000	7590	67945.68	\$5,435.65
December	5265	67410	5	75000	7590	67945.68	\$5,435.65
					Total	700,315 kwh	\$56,025.20

# 75' of Weir Overflow Returned to River



# Actual Quote for Main Pump VFD's

- Yaskawa IQ Pump Drive (high end performance):
- **Your Net: \$ 14,800.00 EA**
- WEG is now making a Good Drive also with a good Pump Software:
- **Your Net: \$ 10,625.00 EA**

**Payback period at \$0.08/kwh.....**

**about 4 months.....**

# Additional Energy Saving Opportunities at Dworshak



- Two New Replacement Pumps Already Purchased
  - Capacity of 200 hp
  - Utilizing only 177 hp to produce 12,000 gpm
  - Fixed Flow Rate BUT motors are VFD Rated
  - Cost per pump ~ \$84,150
  - Total cost ~\$168,300

# Savings Represented by Pump Upgrade

## Savings

- Reduction from 250 hp to 177 hp (x2) 146 hp
- Reduction in Monthly kwh Consumption 78,500 kwh/month
- Savings at \$0.08/kwh \$6,275.00/month

**Payback period at \$0.08/kwh.....**

**about 3 years.....**

**\*\*\*\*Note – the four remaining Main Pumps are original units that have been rebuilt many times. Additional pump upgrades would provide similar operational savings and increase reliability**

# Additional Energy Saving Opportunities at Dworshak

- Replacement of Incubation Chiller with Water-to-Water Heat Pump
  - Utilize waste heat from secondary side of Heat Pump chilling process to supply building heat
  - Currently chill 75 gpm from 42 degrees to 40 degrees from September 1<sup>st</sup> to November 1<sup>st</sup>
    - Could heat 3,000 sq ft with waste heat
  - Currently chill 120 gpm from 41 degrees to 37 degrees from November 1<sup>st</sup> to April 1<sup>st</sup>
    - Could heat almost 10,000 sq ft with waste heat



ELEMENT  
BOILER #2 480V







# Existing Chiller Status



- Only one compressor is operable – therefore only running at 50% capacity
- Currently impacting both steelhead and chinook production schedules because of lost capacity
- Must be replaced or repaired after April 1<sup>st</sup>



# Heat Pump Project Represents.....

- An opportunity to integrate systems to reduce infrastructure requirements while upgrading equipment that has exceeded its useful life
- An opportunity to significantly increase operational efficiencies of both the heating and chilling processes
- An opportunity to increase available hatchery nursery space without building a new nursery

# Additional Energy Saving Opportunities at Dworshak

- Using Reuse to Reduce BTU Consumption



# Additional Energy Saving Opportunities at Dworshak

- Implementation of Reuse Technology in First Stage (Nursery) Rearing
  - Currently heat up to 5200 gpm of reservoir water for use in a FLOW THRU configuration.....  
.....heat it and lose it.....
  - 5200 gpm heated from 40 degrees to 54 degrees =
    - 35,347,200 BTU's
    - 10,360 kwh (not including any pumping costs)
    - \$828/hr or \$19,891/day at \$0.08/kw

# What Else Does 35,347,200 BTU's Mean?



# What Else Does 35,347,200 BTU's Mean?



# What Else Does 35,347,200 BTU's Mean?



# What Else Does 35,347,200 BTU's Mean?



# What Else Does 35,347,200 BTU's Mean?





Dry Mills State Fish Hatchery – Maine

# Additional Energy Saving Opportunities at Dworshak

- Conversion of Nursery Rearing from Single-Pass to Partial Reuse Represents Reduction In Infrastructure & Operational Costs While Improving Safety and Hatchery Effluent Water Quality

## 4.2.1 Additional Energy Saving Opportunities

It is anticipated that there are further substantial opportunities for reduction in energy use at Dworshak NFH. Two such opportunities would be the addition of water reuse systems within the incubation and nursery systems. Existing operations required the use of electric chillers on the incubation water and electric boilers on nursery water to achieve program objectives. With the application of reuse technologies, a large portion of the heating energy applied to the system is retained as the water is recirculated rather than replaced. Although consideration of system design alternatives for these systems is beyond the scope of this report, it is estimated that an additional \$383,000 per year in electrical savings may be realized the nursery system alone based on the application of reuse relative to current operations.



Questions?